Applying Principles of Vaccination to Vaccine Administration Best Practices

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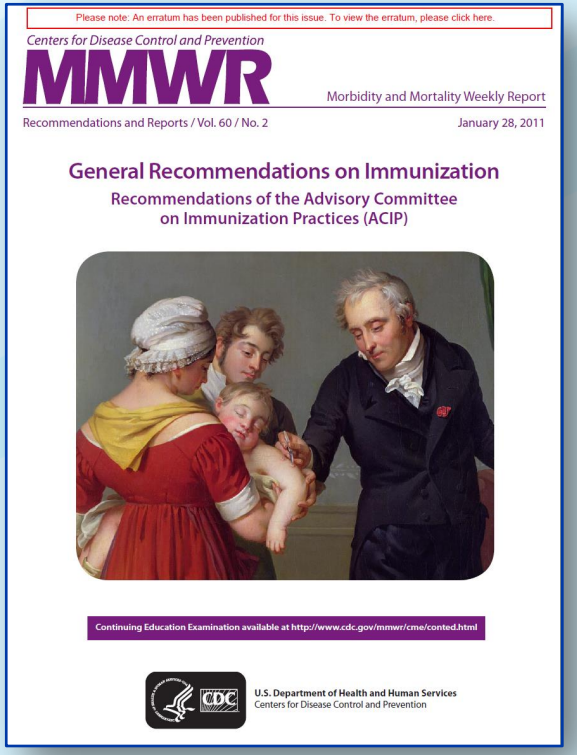
Disclosures

- Donna Weaver is a federal government employee with no financial interest in, or conflict, with the manufacturer of any product named in this presentation
- Content will not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of the discussion of the use of the following vaccines in a manner recommended by Advisory Committee on Immunization Practices, but not approved by the Food and Drug Administration: DTaP-containing vaccines, Hib-containing vaccines, Tdap, RV vaccines, IIV, meningococcal vaccines, and pneumococcal vaccines
- The speaker will not discuss a vaccine not currently licensed by the FDA

General Recommendations on Immunization

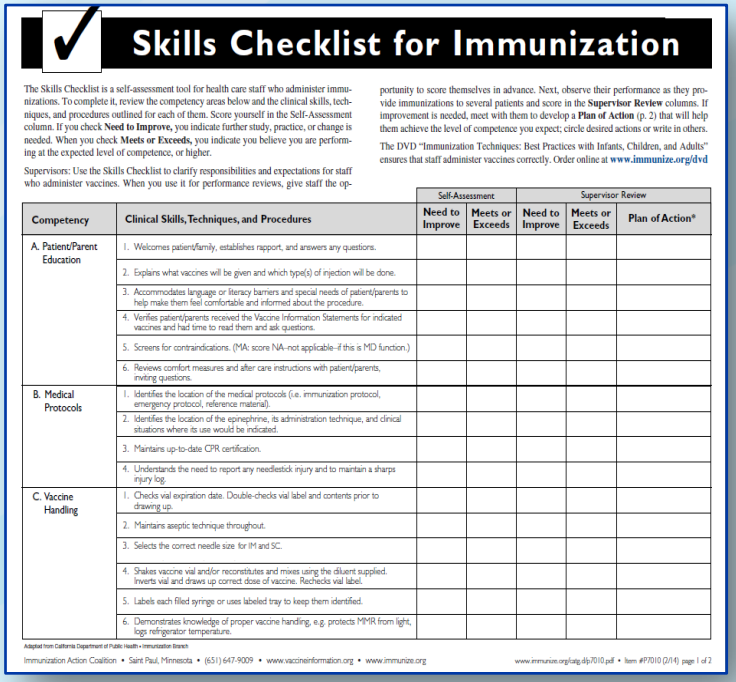
- Failure to adhere to recommendations for storage and handling of vaccines can reduce or destroy their potency, resulting in inadequate or no immune response in the recipient
- Recommendations for route, site, and dosage of vaccines are derived from data from clinical trials, practical experience, preventative health care visits schedule, and theoretical considerations
- Immunization providers should be thoroughly familiar with proper vaccine storage and handling and administration practices



MMWR 2011;60(2):17

Knowledgeable Staff is Key

- **Before administering vaccines, all personnel who will administer vaccines should:**
  - Receive competency-based training
  - Have knowledge and skills validated
- **Integrate competency-based training into:**
  - New staff orientation
  - Annual education requirements
- **Ongoing education:**
  - Whenever vaccine administration recommendations are updated
  - When new vaccines are added to inventory
- **AND establish an environment that values reporting and investigating errors as part of risk management and quality improvement**



Skills Checklist for Immunization

The Skills Checklist is a self-assessment tool for health care staff who administer immunizations. To complete it, review the competency areas below and the clinical skills, techniques, and procedures outlined for each of them. Score yourself in the Self-Assessment column. If you check **Need to Improve,** you indicate further study, practice, or change is needed. When you check **Meets or Exceeds,** you indicate you believe you are performing at the expected level of competence, or higher.

Supervisors: Use the Skills Checklist to clarify responsibilities and expectations for staff who administer vaccines. When you use it for performance reviews, give staff the opportunity to score themselves in advance. Next, observe their performance as they provide immunizations to several patients and score in the **Supervisor Review** columns. If improvement is needed, meet with them to develop a **Plan of Action** (p. 2) that will help them achieve the level of competence you expect; circle desired actions or write in others.

The DVD "Immunization Techniques: Best Practices with Infants, Children, and Adults" ensures that staff administer vaccines correctly. Order online at **www.immunize.org/dvd**

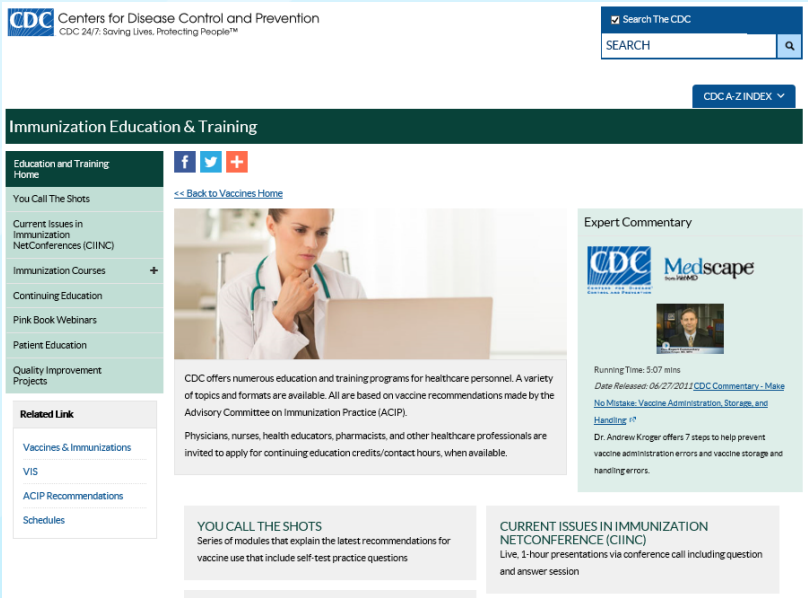
		Self-Assessment		Supervisor Review		
Competency	**Clinical Skills, Techniques, and Procedures**	**Need to Improve**	**Meets or Exceeds**	**Need to Improve**	**Meets or Exceeds**	**Plan of Action***
A. Patient/Parent Education	1. Welcomes patient/family, establishes rapport, and answers any questions.					
	2. Explains what vaccines will be given and which type(s) of injection will be done.					
	3. Accommodates language or literacy barriers and special needs of patient/parents to help make them feel comfortable and informed about the procedure.					
	4. Verifies patient/parents received the Vaccine Information Statements for indicated vaccines and had time to read them and ask questions.					
	5. Screens for contraindications. (MA: score NA–not applicable–if this is MD function.)					
	6. Reviews comfort measures and after care instructions with patient/parents, inviting questions.					
B. Medical Protocols	1. Identifies the location of the medical protocols (i.e. immunization protocol, emergency protocol, reference material).					
	2. Identifies the location of the epinephrine, its administration technique, and clinical situations where its use would be indicated.					
	3. Maintains up-to-date CPR certification.					
	4. Understands the need to report any needlestick injury and to maintain a sharps injury log.					
C. Vaccine Handling	1. Checks vial expiration date. Double-checks vial label and contents prior to drawing up.					
	2. Maintains aseptic technique throughout.					
	3. Selects the correct needle size for IM and SC.					
	4. Shakes vaccine vial and/or reconstitutes and mixes using the diluent supplied. Inverts vial and draws up correct dose of vaccine. Rechecks vial label.					
	5. Labels each filled syringe or uses labeled tray to keep them identified.					
	6. Demonstrates knowledge of proper vaccine handling, e.g. protects MMR from light, logs refrigerator temperature.					

Adapted from California Department of Public Health • Immunization Branch

Skills checklist for immunization
http://www.immunize.org/catg.d/p7010.pdf

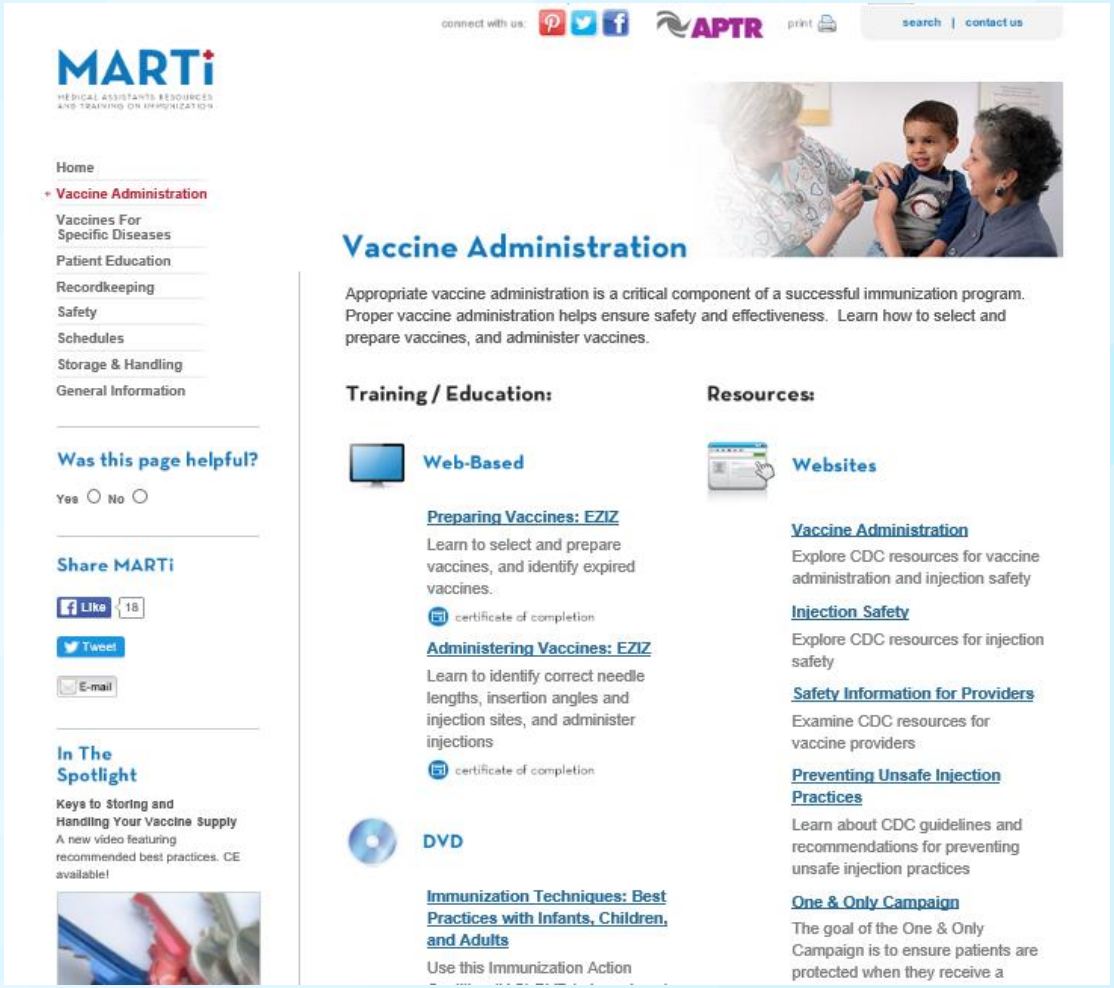
CDC Resources for Staff Education

- **Competency-based education for staff is critical**
- **Multiple education products available free through the CDC website:**
  - Immunization courses
  - You Call the Shots self-study modules
  - Netconferences
- **Continuing education is available**



https://www.cdc.gov/vaccines/ed/index.html

Medical Assistants Resources and Training on Immunization (MARTi)



http://marti-us.org/stage_2/vaccine_administration.shtml

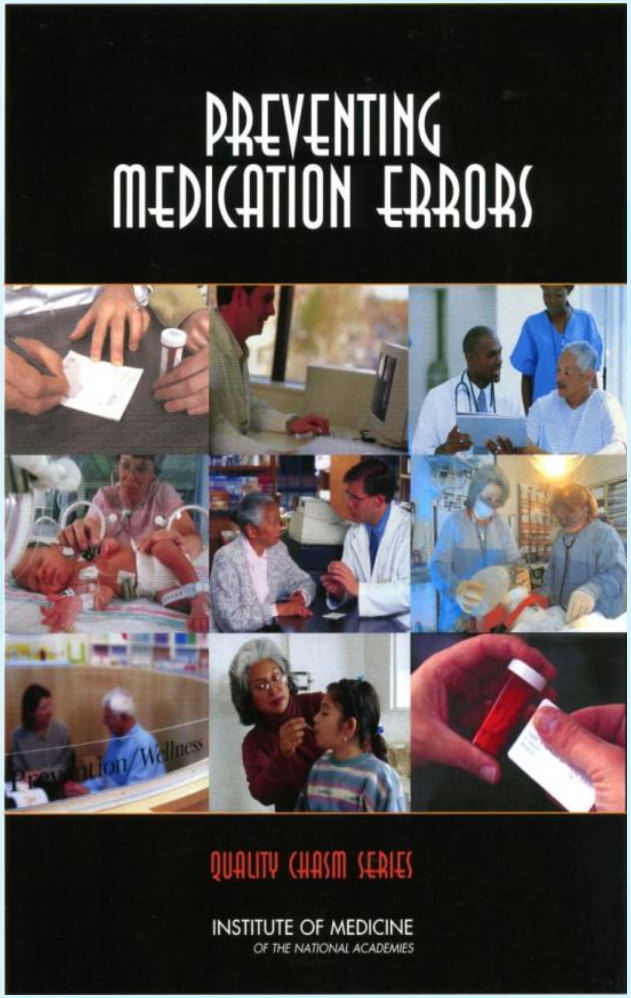
Top 3 Pediatric Vaccine Administration Errors Reported to VAERS 2000 – 2013

- **Inappropriate schedule errors (3,385; 36%)**
  - Most commonly occurs with:
    - Rotavirus vaccines
    - Inactivated influenza vaccine
    - DTaP
    - Quadrivalent human papillomavirus
- **Wrong vaccine administered* (1,981; 21%)**
  - Occurs among vaccines with similar names, acronyms, antigens
- **Storage errors (1,402; 15%)**
  - Expired vaccine administered
  - Incorrect storage of vaccine
  - Vaccines kept outside of proper storage temperature – storage units out of proper range

* Based on clinical review of all reports 0-6 years of age and random sample of 107/637 reports for 7-18 years of age. Specific vaccine trade name that was confused was not specified in most reports

Institute of Medicine (IOM)

- **IOM recommends implementation of proven medication safety practices including:**
  - Reducing reliance on memory
  - Standardization
  - Protocols and checklists
  - Differentiating among products to eliminate look-alike and sound-alike products
  - Monitoring error frequencies, and correct system problems associated with errors



https://www.nap.edu/search/?term=preventing+medication+errors

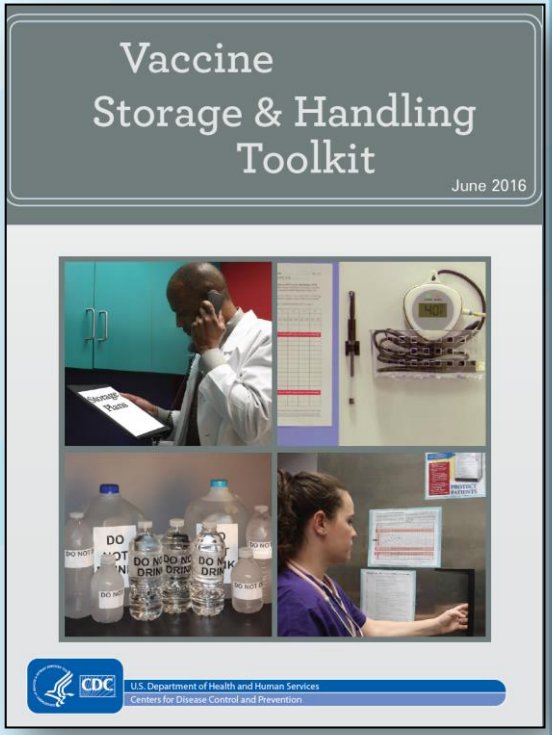
Vaccine Storage and Handling General Recommendations

- As a general rule, vaccines that have been stored at inappropriate temperatures should not be administered
- Vaccine exposed to inappropriate temperatures that is inadvertently administered should generally be repeated. Clinicians should consult with state or local health departments in these situations
- Doses of expired vaccines that are administered inadvertently generally should not be counted as valid and should be repeated. Inactivated vaccines should be repeated as soon as possible. Live vaccines should be repeated after a 28-day interval from the invalid dose

MMWR 2011, 60(2):18 -19

Strategies to Prevent Vaccination Errors
Storage and Handling

- **Designate a person to be the primary vaccine coordinator for your facility**
  - Choose a second staff member to act as an alternate vaccine coordinator
- **Check expiration dates weekly. Promptly remove expired vaccines from the storage unit**
- **Monitor the vaccine storage unit temperature**
- **Use a continuous temperature monitoring device**
- **Take immediate action and isolate vaccine(s) exposed to improper temperatures**



https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf

Exceptions to Vaccine Expiration Dates

- **Reconstitution**
  - Once a lyophilized vaccine is reconstituted, there is a limited timeframe in which the vaccine can be used
- **Multidose vials (MDVs)**
  - Most MDVs may be used until the expiration date printed on the vial unless contaminated or compromised in some way. Some MDVs have a specified timeframe for use once the vial is entered with a needle
- **Manufacturer shortened expiration date**
  - If vaccine has been exposed to inappropriate storage conditions, potency may be reduced before the expiration date. The manufacturer may shorten the expiration date
- **When vaccines must be used prior to the expiration date on the label, this is referred to as the "beyond use date" (or time) or "BUD" noted in the package insert. Note BUD and your initials on label**

Healthcare Providers / Professionals

Vaccine Storage and Handling

Recommendations and Guidelines

Get Email Updates

At a Glance

Proper vaccine storage and handling practices play a very important role in protecting individuals and communities from vaccine-preventable diseases.

Vaccine quality is the shared responsibility of everyone, from the time vaccine is manufactured until it is administered.

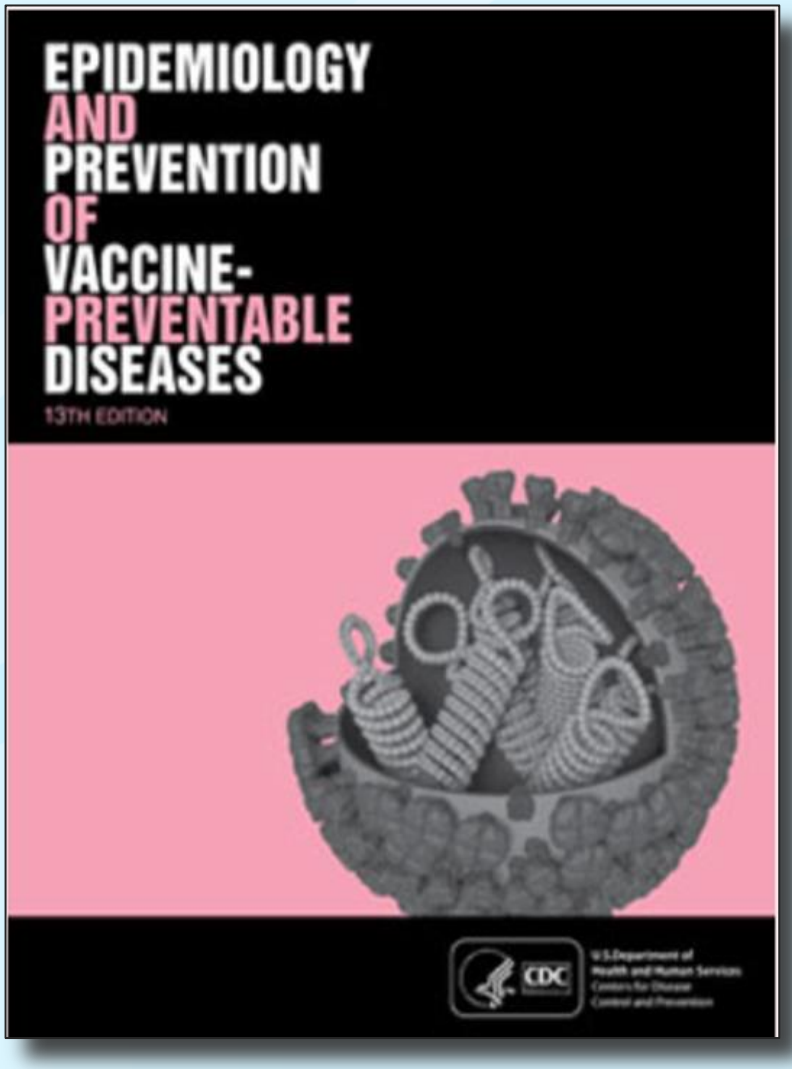
Resources on Proper Vaccine Storage and Handling

- Keys to Storing and Handling Your Vaccine Supply is a video designed to decrease vaccine storage and handling errors and preserve the nation's vaccine supply by demonstrating to immunization providers the recommended best practices for storage and handling of vaccines. (Video is a winner of the Winter/Spring 2014 Web Health Award) May 2014
- These storage and handling fact sheets illustrate best practices for both refrigerated and frozen vaccines. Written in plain language, they include assessments to reinforce key points. While they are CDC-developed and branded fact sheets, each contains an area where you can insert your agency's logo.
  - Vaccine Temperature Best Practices for **Refrigerated Vaccines**—Fahrenheit (F) [2 pages] JUNE 2016
  - Vaccine Temperature Best Practices for **Frozen Vaccines**—Fahrenheit (F) [2 pages] MAY 2014
  - Vaccine Storage Best Practices for **Refrigerated Vaccines**—Fahrenheit (F) [2 pages] JUNE 2016
  - Vaccine Storage Best Practices for **Frozen Vaccines**—Fahrenheit (F) [2 pages] MAY 2014
- Vaccine Storage and Handling Toolkit is a **comprehensive resource** for health care providers on vaccine storage and handling recommendations and best practice strategies. The Toolkit includes guidance on managing and storing vaccine inventory, using and maintaining storage unit and temperature monitoring equipment, preparing for emergency situations, and training staff. **(June 2016)**
- You Call the Shots: Vaccine Storage and Handling Module is an interactive, web-based module which provides learning opportunities, self-test

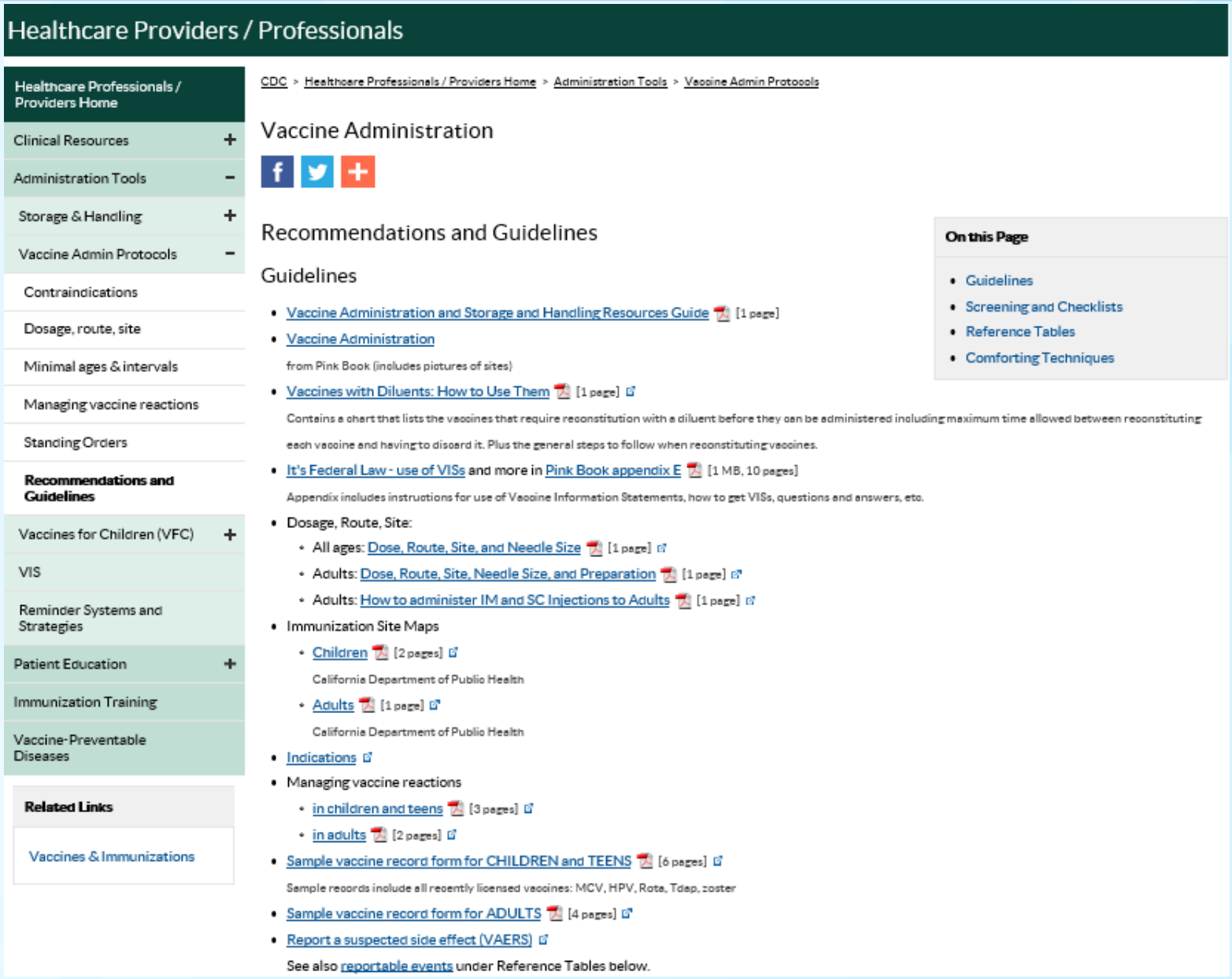
https://www.cdc.gov/vaccines/hcp/admin/storage/index.html

Vaccine Administration

https://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf



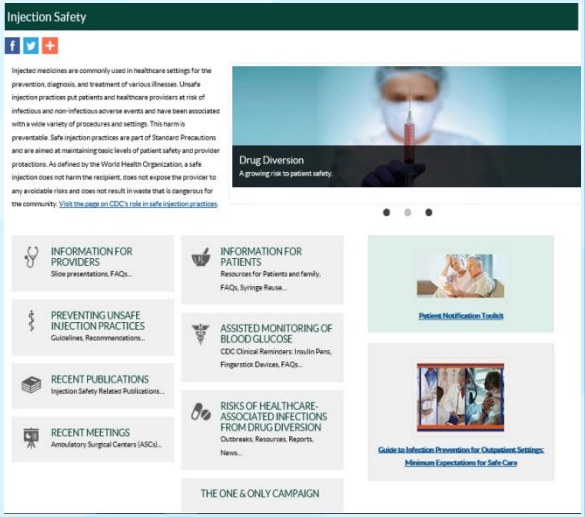
https://www.cdc.gov/vaccines/pubs/pinkbook/index.html



https://www.cdc.gov/vaccines/hcp/admin/recs-guidelines.html

Safe Injection Practices

- Only open a single-dose vial when ready to use. Once protective cap is removed, vaccine should be used. If not used, it should be discarded at end of workday
- Once a manufacturer-filled syringe is activated (i.e., syringe cap removed or needle attached), vaccine should be used or discarded at end of workday
- Only the number of doses indicated in the manufacturer's package insert should be withdrawn from the vial. After the maximum number of doses has been withdrawn, the vial should be discarded, even if there is residual and the expiration date has not been reached
- Draw up vaccines only at time of administration and discard if not used by end of day
- Only administer vaccines that you have prepared

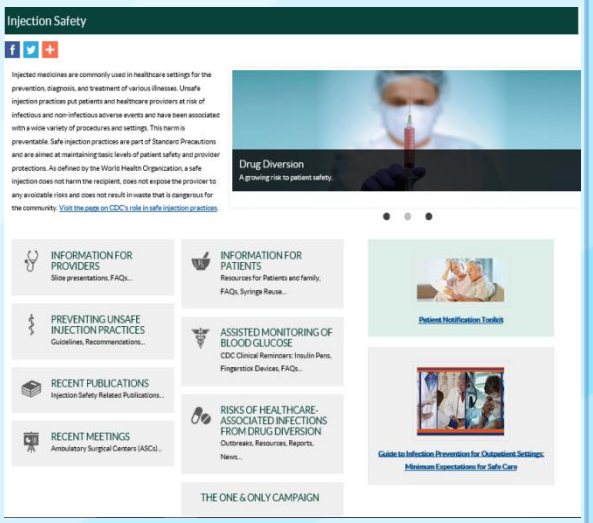


https://www.cdc.gov/injectionsafety/

https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf

Safe Injection Practices

- **NEVER use partial doses from two or more vials to obtain a full dose**
- **Never use a single-dose vial (SDV) for more than one patient**
  - Example: Do not use a 0.5 mL SDV of influenza vaccine to administer two 0.25 mL doses of flu vaccine to different children
- **Never administer vaccines from the same syringe to more than one patient, even if the needle is changed**
- **NEVER use stock vials of sterile water or saline for reconstitution. Only use the diluent supplied by the manufacturer**



https://www.cdc.gov/injectionsafety/

https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf

Vaccines with Diluents: How to Use Them

Be sure to reconstitute the following vaccines correctly before administering them! Reconstitution means that the lyophilized (freeze-dried) vaccine powder or wafer in one vial must be reconstituted (mixed) with the diluent (liquid) in another.

- Only use the diluent provided by the manufacturer for that vaccine as indicated on the chart.
- ALWAYS check the expiration date on the diluent and vaccine. NEVER use expired diluent or vaccine.

Vaccine product name	Manufacturer	Lyophilized vaccine (powder)	Liquid diluent (may contain vaccine)	Time allowed between reconstitution and use*	Diluent storage environment
ActHIB (Hib)	sanofi pasteur	Hib	0.4% sodium chloride	24 hrs	Refrigerator
Hiberix (Hib)	GlaxoSmithKline	Hib	0.9% sodium chloride	24 hrs	Refrigerator or room temp
Imovax (RAB_{HDCV})	sanofi pasteur	Rabies virus	Sterile water	Immediately†	Refrigerator
M-M-R II (MMR)	Merck	MMR	Sterile water	8 hrs	Refrigerator or room temp
MenHibrix (Hib-MenCY)	GlaxoSmithKline	Hib-MenCY	0.9% sodium chloride	Immediately†	Refrigerator or room temp
Menomune (MPSV4)	sanofi pasteur	MPSV4	Distilled water	30 min (single-dose vial) 35 days (multidose vial)	Refrigerator
Menveo (MCV4)	Novartis	MenA	MenCWY	8 hrs	Refrigerator
Pentacel (DTaP-IPV/Hib)	sanofi pasteur	Hib	DTaP-IPV	Immediately†	Refrigerator
ProQuad (MMRV)	Merck	MMRV	Sterile water	30 min	Refrigerator or room temp
RabAvert (RAB_{PCECV})	Novartis	Rabies virus	Sterile water	Immediately†	Refrigerator
Rotarix (RV1)‡	GlaxoSmithKline	RV1	Sterile water, calcium carbonate, and xanthan	24 hrs	Room temp
Varivax (VAR)	Merck	VAR	Sterile water	30 min	Refrigerator or room temp
YF-VAX (YF)	sanofi pasteur	YF	0.9% sodium chloride	60 min	Refrigerator or room temp
Zostavax (HZV)	Merck	HZV	Sterile water	30 min	Refrigerator or room temp

http://www.immunize.org/catg.d/p3040.pdf

Vaccine Administration General Recommendations

- **All vaccines can be administered at the same visit as all other vaccines**
  - Exception: In persons with functional or anatomic asplenia pneumococcal conjugate vaccine (PCV13) and Menactra brand meningococcal conjugate vaccines should not be administered at the same visit; separate these vaccines by at least 4 weeks

MMWR 2018; 62(2):18

Scheduling

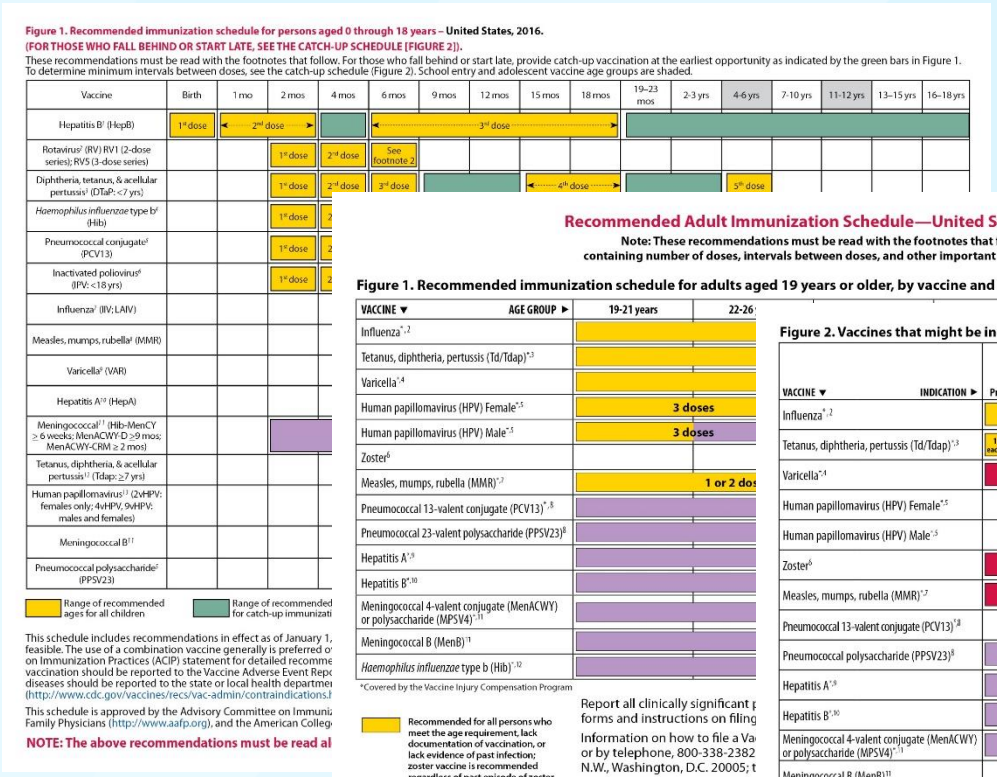


Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2016.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE (FIGURE 2)).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13–15 yrs	16–18 yrs
Hepatitis B[1] (HepB)	1st dose	◄	2nd dose ►				3rd dose ►									
Rotavirus[2] (RV) RV1 (2-dose series); RV5 (3-dose series)			1st dose	2nd dose	See footnote 2											
Diphtheria, tetanus, & acellular pertussis[3] (DTaP: <7 yrs)			1st dose	2nd dose	3rd dose			4th dose ►				5th dose				
Haemophilus influenzae type b[4] (Hib)			1st dose													
Pneumococcal conjugate[5] (PCV13)			1st dose													
Inactivated poliovirus[6] (IPV: <18 yrs)			1st dose													
Influenza[7] (IIV; LAIV)																
Measles, mumps, rubella[8] (MMR)																
Varicella[9] (VAR)																
Hepatitis A[10] (HepA)																
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)																
Tetanus, diphtheria, & acellular pertussis[12] (Tdap: ≥7 yrs)																
Human papillomavirus[13] (2vHPV: females only; 4vHPV, 9vHPV: males and females)																
Meningococcal B[14]																
Pneumococcal polysaccharide[5] (PPSV23)																

Range of recommended ages for all children

Range of recommended for catch-up immunizati

This schedule includes recommendations in effect as of January 1, feasible. The use of a combination vaccine generally is preferred o on Immunization Practices (ACIP) statement for detailed recomme vaccination should be reported to the Vaccine Adverse Event Repo diseases should be reported to the state or local health departme (http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.

This schedule is approved by the Advisory Committee on Immuni Family Physicians (http://www.aafp.org), and the American Colleg

NOTE: The above recommendations must be read al

Recommended Adult Immunization Schedule—United States - 2016

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended immunization schedule for adults aged 19 years or older, by vaccine and age group[1]

VACCINE ▼ AGE GROUP ►	19-21 years	22-26
Influenza[*,2]		
Tetanus, diphtheria, pertussis (Td/Tdap)[*,3]		
Varicella[*,4]		
Human papillomavirus (HPV) Female[*,5]	3 doses	
Human papillomavirus (HPV) Male[*,5]	3 doses	
Zoster[6]		
Measles, mumps, rubella (MMR)[*,7]		1 or 2 dos
Pneumococcal 13-valent conjugate (PCV13)[*,8]		
Pneumococcal 23-valent polysaccharide (PPSV23)[8]		
Hepatitis A[*,9]		
Hepatitis B[*,10]		
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)[*,11]		
Meningococcal B (MenB)[11]		
Haemophilus influenzae type b (Hib)[*,12]		

*Covered by the Vaccine Injury Compensation Program

Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster

Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)

No recommendation

Report all clinically significant p forms and instructions on filing

Information on how to file a Va or by telephone, 800-338-2382 N.W., Washington, D.C. 20005; t

Additional information about t is also available at www.cdc.go and Spanish, 8:00 a.m. - 8:00 p.

Use of trade names and comme of Health and Human Services.

The recommendations in this s Committee on Immunization P of Physicians (ACP), the Americ Midwives (ACNM).

Figure 2. Vaccines that might be indicated for adults aged 19 years or older based on medical and other indications[1]

VACCINE ▼ INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding HIV infection)[4,6,7,8,13]	HIV infection CD4+ count (cells/μL)[4,6,7,8,13] < 200	HIV infection CD4+ count (cells/μL)[4,6,7,8,13] ≥ 200	Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, on hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia and persistent complement component deficiencies[9,11,12]	Chronic liver disease	Diabetes	Healthcare personnel
Influenza[*,2]	1 dose annually										
Tetanus, diphtheria, pertussis (Td/Tdap)[*,3]	1 dose Tdap each pregnancy	Substitute Tdap for Td once, then Td booster every 10 yrs									
Varicella[*,4]	Contraindicated	2 doses									
Human papillomavirus (HPV) Female[*,5]		3 doses through age 26 yrs			3 doses through age 26 yrs						
Human papillomavirus (HPV) Male[*,5]		3 doses through age 26 yrs			3 doses through age 21 yrs						
Zoster[6]	Contraindicated				1 dose						
Measles, mumps, rubella (MMR)[*,7]	Contraindicated	1 or 2 doses depending on indication									
Pneumococcal 13-valent conjugate (PCV13)[†,8]		1 dose									
Pneumococcal polysaccharide (PPSV23)[8]		1, 2, or 3 doses depending on indication									
Hepatitis A[*,9]		2 or 3 doses depending on vaccine									
Hepatitis B[*,10]		3 doses									
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)[*,11]		1 or more doses depending on indication									
Meningococcal B (MenB)[11]		2 or 3 doses depending on vaccine									
Haemophilus influenzae type b (Hib)[*,12]		3 doses post-HSCT recipients only	1 dose								

*Covered by the Vaccine Injury Compensation Program

Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster

Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)

No recommendation

Contraindicated

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults aged ≥19 years, as of February 2016. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/hcp/acip-recs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

https://www.cdc.gov/vaccines/schedules/hcp/index.html

Vaccine and Antibody-containing Products General Recommendations

- **Inactivated vaccines are generally not affected by circulating antibody to the antigen**
  - Example: HepB can be administered at the same time as HBIG in a separate syringe and in a separate limb
- **Live attenuated vaccines may be affected by circulating antibody to the antigen**
  - After antibody-containing product is given, delay live vaccines (other than yellow fever, oral Ty21a typhoid, LAIV, zoster, and rotavirus) until passive antibody has degraded
  - If dose of injectable live-virus vaccine (other than yellow fever and zoster) is administered after an antibody-containing product but at interval shorter than recommended, repeat vaccine dose unless serologic testing is feasible and indicates response to the vaccine. The repeat dose or serologic testing should be performed after interval indicated for the antibody-containing product

MMWR 2011, 60(2):9 Tables 4 & 5

Recommended intervals between administration of **immune globulin preparations** and **measles-** or **varicella-containing vaccine**

Product / Indication	Dose, including mg immunoglobulin G (IgG)/kg body weight	Recommended interval before measles or varicella-containing[1] vaccine administration
Blood transfusion		
- Red blood cells (RBCs), washed	10 mL/kg (negligible IgG/kg) IV	None
- RBCs, adenine-saline added	10 mL/kg (10 mg IgG/kg) IV	3 months
- Packed RBCs (hematocrit 65%)[2]	10 mL/kg (60 mg IgG/kg) IV	6 months
- Whole blood (hematocrit 35%-50%)[2]	10 mL/kg (80-100 mg IgG/kg) IV	6 months
- Plasma/platelet products	10 mL/kg (160 mg IgG/kg) IV	7 months
Botulinum Immune Globulin Intravenous (Human)	1.5 mL/kg (75 mg IgG/kg) IV	6 months
Cytomegalovirus IGIV	150 mg/kg maximum	6 months
Hepatitis A IG		
- Contact prophylaxis	0.02 mL/kg (3.3 mg IgG/kg) IM	3 months
- International travel	0.06 mL/kg (10 mg IgG/kg) IM	3 months
Hepatitis B IG (HBIG)	0.06 mL/kg (10 mg IgG/kg) IM	3 months
IGIV		
- Replacement therapy for immune deficiencies[3]	300-400 mg/kg IV	8 months
- Immune thrombocytopenic purpura treatment	400 mg/kg IV	8 months
- Measles IG, contact prophylaxis (immunocompromised contact)	400 mg/kg IV	6 months
- Postexposure varicella prophylaxis	400 mg/kg IV	8 months
- Immune thrombocytopenic purpura treatment	1,000 mg/kg IV	10 months
Measles IG, contact prophylaxis - Standard (i.e., nonimmunocompromised) contact	0.5 mL/kg (80 mg IgG/kg) IM	6 months
Monoclonal antibody to respiratory syncytial virus F protein (Synagis™)[4]	15 mg/kg (IM)	None
Rabies IG (RIG)	20 IU/kg (22 mg IgG/kg) IM	4 months
Tetanus IG (TIG)	250 units (10 mg IgG/kg) IM	3 months
Varicella IG[5]	125 units/10 kg (60-200 mg IgG/kg) IM, maximum 625 units	5 months

This table is not intended for determining the correct indications and dosages for using antibody-containing products. Unvaccinated persons might not be fully protected against measles during the entire recommended interval, and additional doses of IG or measles vaccine might be indicated after measles exposure. Concentrations of measles antibody in an IG preparation can vary by manufacturer's lot. Rates of antibody clearance after receipt of an IG preparation also might vary. Recommended intervals are extrapolated from an estimated half-life of 30 days for passively acquired antibody and an observed interference with the immune response to measles vaccine for 5 months after a dose of 80 mg IgG/kg.

1 Does not include zoster vaccine. Zoster vaccine may be given with antibody-containing blood products.

2 Assumes a serum IgG concentration of 16 mg/mL.

3 Measles vaccination is recommended for children with mild or moderate immunosuppression from human immunodeficiency virus (HIV) infection, and varicella vaccination may be considered for children with mild or moderate immunosuppression from HIV, but both are contraindicated for persons with severe immunosuppression from HIV or any other immunosuppressive disorder.

4 Contains antibody only to respiratory syncytial virus.

5 Licensed VariZIG is a purified human IG preparation made from plasma containing high levels of anti-varicella antibodies (IgG).

Adapted from Table 5, ACIP General Recommendations on Immunization

June 2014

https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/a/mmr_ig.pdf

Vaccines and Interval Spacing General Recommendations

- **Increasing the interval between doses of a multidose vaccine does not diminish the effectiveness of the vaccine**
- **Decreasing the interval between doses of a multidose vaccine may interfere with antibody response and protection**
  - Doses administered 5 days or earlier than minimum interval or age should not be counted as valid doses and should be repeated as age appropriate.
  - Repeat dose should generally be spaced after invalid dose by an interval at least equal to recommended minimum interval

MMWR 2011, 60(2):5

Recommended and Minimum Ages and Intervals Between Doses of Routinely Recommended Vaccines[1,2,3,4]

Vaccine and dose number	Recommended age for this dose	Minimum age for this dose	Recommended interval to next dose	Minimum interval to next dose
Diphtheria-tetanus-acellular pertussis (DTaP)-1[5]	2 months	6 weeks	8 weeks	4 weeks
DTaP-2	4 months	10 weeks	8 weeks	4 weeks
DTaP-3	6 months	14 weeks	6-12 months	6 months[6]
DTaP-4[6]	15-18 months	12 months[6]	3 years	6 months
DTaP-5	4-6 years	4 years	—	—
Haemophilus influenzae type b (Hib)-1[5,7]	2 months	6 weeks	8 weeks	4 weeks
Hib-2	4 months	10 weeks	8 weeks	4 weeks
Hib-3[8]	6 months	14 weeks	6-9 months	8 weeks
Hib-4	12-15 months	12 months	—	—
Hepatitis A (HepA)-1[5]	12-23 months	12 months	6-18 months	6 months
HepA-2	≥18 months	18 months	—	—
Hepatitis B (HepB)-1[9]	Birth	Birth	4 weeks-4 months	4 weeks
HepB-2	1-2 months	4 weeks	8 weeks-17 months	8 weeks
HepB-3[9]	6-18 months	24 weeks	—	—
Herpes zoster (HZV)[10]	≥60 years	60 years	—	—
Human papillomavirus (HPV)-1[11]	11-12 years	9 years	8 weeks	4 weeks
HPV-2	11-12 years (+ 2 months)	9 years (+ 4 weeks)	4 months	12 weeks[12]
HPV-3[12]	11-12 years (+ 6 months)	9 years (+24 weeks)	—	—
Influenza, inactivated (IIV)[13]	≥6 months	6 months[14]	4 weeks	4 weeks
Influenza, live attenuated (LAIV)[13]	2-49 years	2 years	4 weeks	4 weeks
Measles-mumps-rubella (MMR)-1[15]	12-15 months	12 months	3-5 years	4 weeks
MMR-2[15]	4-6 years	13 months	—	—
Meningococcal conjugate (MCV)-1[16]	11-12 years	6 weeks[17]	4-5 years	8 weeks
MCV-2	16 years	11 years (+ 8 weeks)	—	—
Meningococcal polysaccharide (MPSV4)-1[16]	—	2 years	5 years	5 years
MPSV4-2	—	7 years	—	—
Pneumococcal conjugate (PCV)-1[7]	2 months	6 weeks	8 weeks	4 weeks
PCV-2	4 months	10 weeks	8 weeks	4 weeks
PCV-3	6 months	14 weeks	6 months	8 weeks
PCV-4	12-15 months	12 months	—	—
Pneumococcal polysaccharide (PPSV)-1	—	2 years	5 years	5 years
PPSV-2[18]	—	7 years	—	—
Poliovirus, inactivated (IPV)-1[5]	2 months	6 weeks	8 weeks	4 weeks
IPV-2	4 months	10 weeks	8 weeks-14 months	4 weeks
IPV-3	6-18 months	14 weeks	3-5 years	6 months
IPV-4[19]	4-6 years	4 years	—	—
Rotavirus (RV)-1[20]	2 months	6 weeks	8 weeks	4 weeks
RV-2	4 months	10 weeks	8 weeks	4 weeks
RV-3[21]	6 months	14 weeks	—	—
Tetanus-diphtheria (Td)	11-12 years	7 years	10 years	5 years
Tetanus-diphtheria-acellular pertussis (Tdap)[22]	≥11 years	7 years	—	—
Varicella (Var)-1[23]	12-15 months	12 months	3-5 years	12 weeks[23]
Var-2[23,24]	4-6 years	15 months[24]	—	—

https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/a/age-interval-table.pdf

FIGURE 2. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind —United States, 2016.

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with Figure 1 and the footnotes that follow.

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Children age 4 months through 6 years					
Hepatitis B[1]	Birth	4 weeks	8 weeks *and* at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.		
Rotavirus[2]	6 weeks	4 weeks	4 weeks[2]		
Diphtheria, tetanus, and acellular pertussis[3]	6 weeks	4 weeks	4 weeks	6 months	6 months[3]
Haemophilus influenzae type b[4]	6 weeks	4 weeks if first dose was administered before the 1st birthday. 8 weeks (as final dose) if first dose was administered at age 12 through 14 months. No further doses needed if first dose was administered at age 15 months or older.	4 weeks[4] if current age is younger than 12 months **and** first dose was administered at younger than age 7 months, **and** at least 1 previous dose was PRP-T (ActHib, Pentacel) or unknown. 8 weeks *and* age 12 through 59 months (as final dose for healthy children)[4] • if current age is younger than 12 months **and** first dose was administered at age 7 through 11 months (wait until at least 12 months old); OR • if current age is 12 through 59 months **and** first dose was administered before the 1st birthday, **and** second dose administered at younger than 15 months; OR • if both doses were PRP-OMP (PedvaxHIB; Comvax) **and** were administered before the 1st birthday (wait until at least 12 months old). No further doses needed if previous dose was administered at age 15 months or older.	8 weeks (as final dose) This dose only necessary for children age 12 through 59 months who received 3 doses before the 1st birthday.	
Pneumococcal[5]	6 weeks	4 weeks if first dose administered before the 1st birthday. 8 weeks (as final dose for healthy children) if first dose was administered at the 1st birthday or after. No further doses needed for healthy children if first dose administered at age 24 months or older.	4 weeks if current age is younger than 12 months and previous dose given at <7months old. 8 weeks (as final dose for healthy children) if previous dose given between 7-11 months (wait until at least 12 months old); OR if current age is 12 months or older and at least 1 dose was given before age 12 months. No further doses needed for healthy children if previous dose administered at age 24 months or older.	8 weeks (as final dose) This dose only necessary for children aged 12 through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age.	
Inactivated poliovirus[6]	6 weeks	4 weeks[6]	4 weeks[6]	6 months[6] (minimum age 4 years for final dose).	
Measles, mumps, rubella[8]	12 months	4 weeks			
Varicella[9]	12 months	3 months			
Hepatitis A[10]	12 months	6 months			
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)	6 weeks	8 weeks[11]	See footnote 11	See footnote 11	
Children and adolescents age 7 through 18 years					
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)	Not Applicable (N/A)	8 weeks[11]			
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis[12]	7 years[12]	4 weeks	4 weeks if first dose of DTaP/DT was administered before the 1st birthday. 6 months (as final dose) if first dose of DTaP/DT or Tdap/Td was administered at or after the 1st birthday.	6 months if first dose of DTaP/DT was administered before the 1st birthday.	
Human papillomavirus[13]	9 years	Routine dosing intervals are recommended.[13]			
Hepatitis A[10]	N/A	6 months			
Hepatitis B[1]	N/A	4 weeks	8 weeks **and** at least 16 weeks after first dose.		
Inactivated poliovirus[6]	N/A	4 weeks	4 weeks[6]	6 months[6]	
Meningococcal[11]	N/A	8 weeks[11]			
Measles, mumps, rubella[8]	N/A	4 weeks			
Varicella[9]	N/A	3 months if younger than age 13 years. 4 weeks if age 13 years or older.			

NOTE: The above recommendations must be read along with the footnotes of this schedule.

https://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html

Diphtheria, Tetanus, and Pertussis-Containing Vaccines Catch-Up Guidance for Children 4 Months through 18 Years of Age 2015

IF current age is	AND # of previous Doses of DTaP or DT	AND	AND	THEN	Next Dose Due
4 months through 11 months	Unknown or 0	→	→	Give Dose 1 (DTaP) today	Give Dose 2 (DTaP) at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1	→	Give Dose 2 (DTaP) today	Give Dose 3 (DTaP) at least 4 weeks after Dose 2
		It has **not** been at least 4 weeks since Dose 1	→	No dose today	Give Dose 2 (DTaP) at least 4 weeks after Dose 1
	2	It has been at least 4 weeks since Dose 2	→	Give Dose 3 (DTaP) today	Give Dose 4 (DTaP) at least 6 calendar months after Dose 3 **and** at least 15 months of age
		It has **not** been at least 4 weeks since Dose 2	→	No dose today	Give Dose 3 (DTaP) at least 4 weeks after Dose 2
1 through 3 years	Unknown or 0	→	→	Give Dose 1 (DTaP) today	Give Dose 2 (DTaP) at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1	→	Give Dose 2 (DTaP) today	Give Dose 3 (DTaP) at least 4 weeks after Dose 2
		It has **not** been 4 weeks since Dose 1	→	No dose today	Give Dose 2 (DTaP) at least 4 weeks after Dose 1
	2	It has been at least 4 weeks since Dose 2	→	Give Dose 3 (DTaP) today	Give Dose 4 (DTaP) at least 6 calendar months after Dose 3
		It has **not** been 4 weeks since Dose 2	→	No dose today	Give Dose 3 (DTaP) at least 4 weeks after Dose 2
	3	It has been at least 6 calendar months since Dose 3	→	If 12 through14 months of age, no dose today	Give Dose 4 (DTaP) at 15 through 18 months of age
				If 15 months of age or older, give Dose 4 (DTaP) today	Give Dose 5 (DTaP) at least 6 months after Dose 4 **and** at 4 through 6 years of age
		It has **not** been 6 calendar months since Dose 3	→	No dose today	Give Dose 4 (DTaP) at least 6 months after Dose 3

Vaccine Information: DTaP: Administer to children 6 weeks through 6 years of age without a contraindication or precaution to pertussis vaccine. DT: Administer to children 6 weeks through 6 years of age with a contraindication to pertussis vaccine. Tdap: Administer to persons 7 years of age and older without a contraindication or precaution to pertussis vaccine. Td: Administer to persons 7 years of age and older previously vaccinated with Tdap or with a contraindication to pertussis vaccine.

Reference: Recommended immunization schedule for persons aged 0 through 18 years- United States, 2015.
http://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf

CDC
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https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/dtap.pdf

Haemophilus Influenzae type b-Containing Vaccines Catch-Up Guidance for Children 4 Months through 18 Years of Age 2015

Hib Vaccine Products: ActHIB, Pentacel, MenHibRix, or Unknown

IF current age is	AND # of previous doses is	AND		THEN	Next dose due
4 through 6 months	Unknown or 0	→		Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1		Give Dose 2 today	Give Dose 3 at least 4 weeks after Dose 2
		It has **not** been 4 weeks since Dose 1		No dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	It has been at least 4 weeks since Dose 2		Give Dose 3 today	Give Dose 4 at 12 months of age or older (Final Dose)
		It has **not** been 4 weeks since Dose 2		No dose today	Give Dose 3 at least 4 weeks after Dose 2
7 through 11 months	Unknown or 0	→	→	Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	It has been at least 4 weeks since Dose 1	→	Give Dose 2 today	**IF** Dose 1 was given **before** 7 months of age, give Dose 3 at least 4 weeks after Dose 2
					IF Dose 1 was given **after** 7 months of age or older , give Dose 3 **(Final Dose)** at least 8 weeks after Dose 2 **and** at 12 months of age or older
		It has **not** been 4 weeks since Dose 1	→	No dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	Dose 1 was given **before** 7 months of age	It has been at least 4 weeks since Dose 2	Give Dose 3 today	Give Dose 4 **(Final Dose)** at least 8 weeks after Dose 3 **and** at least 12 months of age
			It has **not** been 4 weeks since Dose 2	No dose today	Give Dose 3 at least 4 weeks after Dose 2
		Dose 1 was given at 7 months of age or older	→	No dose today	Give Dose 3 **(Final Dose)** at least 8 weeks after Dose 2, **and** at least 12 months of age

Reference: Recommended immunization schedule for persons aged 0 through 18 years- United States, 2015.
http://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf

https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/hib-acthib.pdf

Haemophilus Influenzae type b-Containing Vaccines Catch-Up Guidance for Children 4 Months through 18 Years of Age 2015

Hib Vaccine Products: Pedvax and Comvax Vaccines Only

IF current age is	AND # of previous doses is	AND	AND	THEN	NEXT DOSE DUE
4 through 6 Months	0	→	→	Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	→	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at 12 months of age or older (Final Dose)
		→	It has not been 4 weeks since Dose 1	No dose today	Give Dose 2 at least 4 weeks after Dose 1
7 through 11 Months	0	→	→	Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	→	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at least 8 weeks after Dose 2 and at 12 months of age or older (Final Dose)
		→	It has not been 4 weeks since Dose 1	No dose today	Give Dose 2 at least 4 weeks after Dose 1
12 through 14 Months	0	→	→	Give Dose 1 today	Give Dose 2 at least 8 weeks after Dose 1 (Final Dose)
	1	Dose 1 was given before 12 months of age	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at least 8 weeks after Dose 2 (Final Dose)
			It has not been 4 weeks since Dose 1	No dose today	Give Dose 2 at least 4 weeks after Dose 1
		Dose 1 was given at 12 months of age or older	It has been at least 8 weeks since Dose 1	Give Dose 2 today (Final Dose)	No additional doses needed
			It has not been 8 weeks since Dose 1	No dose today	Give Dose 2 at least 8 weeks after Dose 1 (Final Dose)
	2	Dose 1 was given before 12 months of age	It has been at least 8 weeks since Dose 2	Give Dose 3 today (Final Dose)	No additional doses needed
			It has not been 8 weeks since Dose 2	No dose today	Give Dose 3 at least 8 weeks after Dose 2 (Final Dose)
		Dose 1 was given at 12 months of age or older	→	No dose today	No additional doses needed

Reference: Recommended immunization schedule for persons aged 0 through 18 years- United States, 2015.
http://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf

CDC Centers for Disease Control and Prevention

https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/hib-pedvax.pdf

Pneumococcal Conjugate Vaccine (PCV) Catch-Up Guidance for Children 4 Months through 18 Years of Age 2015

IF current age is	AND # of previous doses is	AND		THEN	NEXT DOSE
4 - 6 Months	0 or unknown	→	→	Give Dose 1 today	Give Dose 2 at least 4 weeks after Dose 1
	1	→	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at least 4 weeks after Dose 2
		→	It has **not** been at least 4 weeks since Dose 1	No Dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	→	It has been at least 4 weeks since Dose 2	Give Dose 3 today	Give Dose 4 (**Final Dose**) at 12 months of age or older
		→	It has **not** been at least 4 weeks since Dose 2	No Dose today	Give Dose 3 at least 4 weeks after Dose 2
7-11 Months	0	→	→	Give Dose 1 Today	Give Dose 2 at least 4 weeks after Dose 1
	1	Dose 1 was given **before** 7 months of age	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at least 8 weeks after Dose 2 **and** at 12 months of age or older (**Final Dose**)
			It has **not** been 4 weeks since Dose 1	No Dose today	Give Dose 2 at least 4 weeks after Dose 1
		Dose 1 was given at 7 months or older	It has been at least 4 weeks since Dose 1	Give Dose 2 today	Give Dose 3 at least 8 weeks after Dose 2 **and** at 12 months of age or older (**Final Dose**)
			It has **not** been 4 weeks since Dose 1	No Dose today	Give Dose 2 at least 4 weeks after Dose 1
	2	Dose 2 was given **before** 7 months of age	It has been at least 4 weeks since Dose 2	Give Dose 3 today	Give Dose 4 at least 8 weeks after Dose 3 **and** at 12 months of age or older (**Final Dose**)
			It has **not** been 4 weeks since Dose 2	No Dose today	Give Dose 3 at least 4 weeks after Dose 2
		Dose 2 was given at 7 months or older	→	No Dose today	Give Dose 3 at least 8 weeks after Dose 2 **and** at 12 months of age or older (**Final Dose**)

Reference: Recommended immunization schedule for persons aged 0 through 18 years- United States, 2015.
http://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf

https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/pneumococcal.pdf
Adults: https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf

Vaccine Administration General Recommendations

- **Injectable immunobiologics should be administered where local, neural, vascular, or tissue injury is unlikely**
- **Appropriate needle length depends on age and body mass**
  - Use of longer needles has been associated with less redness or swelling than occurs with shorter needles because of injection into deeper muscle mass
  - For all intramuscular injections, the needle should be long enough to reach the muscle mass and prevent vaccine from seeping into subcutaneous tissue, but not so long as to involve underlying nerves, blood vessels, or bone
- **Vaccinators should be familiar with the anatomy of the area into which they are injecting vaccine**

MMWR 2011, 60(2):5

Administering Vaccines:
Dose, Route, Site, and Needle Size

Vaccine	Dose	Route
Diphtheria, Tetanus, Pertussis (DTaP, DT, Tdap, Td)	0.5 mL	IM
Haemophilus influenzae type b (Hib)	0.5 mL	IM
Hepatitis A (HepA)	<18 yrs: 0.5 mL	IM
	≥19 yrs: 1.0 mL	
Hepatitis B (HepB) *Persons 11–15 yrs may be given Recombivax HB (Merck) 1.0 mL adult formulation on a 2-dose schedule.*	<19 yrs: 0.5 mL	IM
	≥20 yrs: 1.0 mL	
Human papillomavirus (HPV)	0.5 mL	IM
Influenza, live attenuated (LAIV)	0.2 mL (0.1 mL in each nostril)	Intranasal spray
Influenza, inactivated (IIV); recombinant (RIV), for ages 18 years and older	6–35 mos: 0.25 mL	IM
	≥3 yrs: 0.5 mL	
Influenza (IIV) Fluzone Intradermal, for ages 18 through 64 years	0.1 mL	ID
Measles, Mumps, Rubella (MMR)	0.5 mL	Subcut
Meningococcal conjugate (MCV4 [MenACWY])	0.5 mL	IM
Meningococcal serogroup B (MenB)	0.5 mL	IM
Meningococcal polysaccharide (MPSV)	0.5 mL	Subcut
Pneumococcal conjugate (PCV)	0.5 mL	IM
Pneumococcal polysaccharide (PPSV)	0.5 mL	IM or Subcut
Polio, inactivated (IPV)	0.5 mL	IM or Subcut
Rotavirus (RV)	Rotarix: 1.0 mL	Oral
	RotaTeq: 2.0 mL	
Varicella (Var)	0.5 mL	Subcut
Zoster (Zos)	0.65 mL	Subcut
Combination Vaccines		
DTaP-HepB-IPV (Pediarix) DTaP-IPV/Hib (Pentacel) DTaP-IPV (Kinrix; Quadracel) Hib-HepB (Comvax) Hib-MenCY (MenHibrix)	0.5 mL	IM
MMRV (ProQuad)	<12 yrs: 0.5 mL	Subcut
HepA-HepB (Twinrix)	≥18 yrs: 1.0 mL	IM

Injection Site and Needle Size

Subcutaneous (Subcut) injection
Use a 23–25 gauge needle. Choose the injection site that is appropriate to the person's age and body mass.

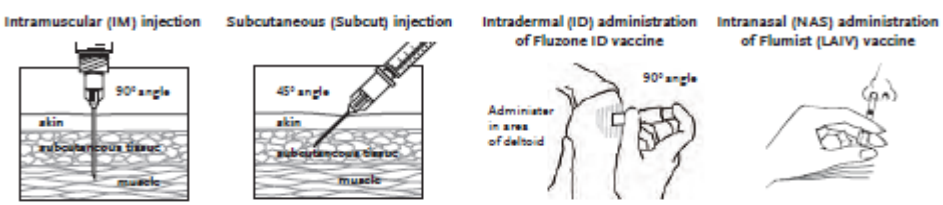
AGE	NEEDLE LENGTH	INJECTION SITE
Infants (1–12 mos)	⅝"	Fatty tissue over anterolateral thigh muscle
Children 12 mos or older, adolescents, and adults	⅝"	Fatty tissue over anterolateral thigh muscle or fatty tissue over triceps

Intramuscular (IM) injection
Use a 22–25 gauge needle. Choose the injection site and needle length that is appropriate to the person's age and body mass.

AGE	NEEDLE LENGTH	INJECTION SITE
Newborns (1st 28 days)	⅝"	Anterolateral thigh muscle
Infants (1–12 mos)	1"	Anterolateral thigh muscle
Toddlers (1–2 years)	1–1¼"	Anterolateral thigh muscle
	⅝–1"	Deltoid muscle of arm
Children and teens (3–18 years)	⅝–1"*	Deltoid muscle of arm
	1–1¼"	Anterolateral thigh muscle
Adults 19 years or older		
Female or male <130 lbs	⅝–1"*	Deltoid muscle of arm
Female or male 130–152 lbs	1"	Deltoid muscle of arm
Female 153–200 lbs Male 130–260 lbs	1–1½"	Deltoid muscle of arm
Female 200+ lbs Male 260+ lbs	1½"	Deltoid muscle of arm

* A ⅝" needle may be used for patients weighing less than 130 lbs (<60 kg) for IM injection in the deltoid muscle only if the skin stretched tight, the subcutaneous tissue is not bunched, and the injection is made at a 90-degree angle.

NOTE: Always refer to the package insert included with each biologic for complete vaccine administration information. CDC's Advisory Committee on Immunization Practices (ACIP) recommendations for the particular vaccine should be reviewed as well. Access the ACIP recommendations at www.immunize.org/acip.



Technical content reviewed by the Centers for Disease Control and Prevention

IMMUNIZATION ACTION COALITION Saint Paul, Minnesota • 651-647-9009 • www.immunize.org • www.vaccineinformation.org

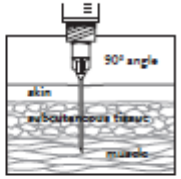
www.immunize.org/catg.d/p3085.pdf • Item #P3085 (6/16)

http://www.immunize.org/catg.d/p3085.pdf

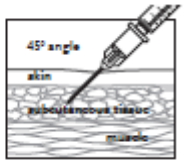
Administering Vaccines to Adults: Dose, Route, Site, and Needle Size

VACCINE	DOSE	ROUTE
Hepatitis A (HepA)	≤18 yrs: 0.5 mL ≥19 yrs: 1.0 mL	IM
Hepatitis B (HepB)	≤19 yrs: 0.5 mL ≥20 yrs: 1.0 mL	IM
HepA-HepB (Twinrix)	≥18 yrs: 1.0 mL	IM
Human papillomavirus (HPV)	0.5 mL	IM
Influenza, live attenuated (LAIV)	0.2 mL (0.1 mL into each nostril)	NAS (Intranasal spray)
Influenza, inactivated (IIV) **and recombinant** (RIV)	0.5 mL	IM
Influenza (IIV) **Fluzone Intradermal, for ages 18 through 64 years**	0.1 mL	ID (Intradermal)
Measles, Mumps, Rubella (MMR)	0.5 mL	SubCut
Meningococcal conjugate (MenACWY)	0.5 mL	IM
Meningococcal protein (MenB)	0.5 mL	IM
Meningococcal serogroup B (MenB)	0.5 mL	IM
Meningococcal polysaccharide (MPSV)	0.5 mL	SubCut
Pneumococcal conjugate (PCV13)	0.5 mL	IM
Pneumococcal polysaccharide (PPSV)	0.5 mL	IM or SubCut
Tetanus, Diphtheria (Td) **with Pertussis** (Tdap)	0.5 mL	IM
Varicella (VAR)	0.5 mL	SubCut
Zoster (HZV)	0.65 mL	SubCut

Intramuscular (IM) injection



Subcutaneous (SubCut) injection



Intradermal (ID) administration of Fluzone ID vaccine

Intranasal (NAS) administration of Flumist (LAIV) vaccine

Injection Site and Needle Size

Subcutaneous (SubCut) injection – Use a 23–25 gauge, 5/8" needle. Inject in fatty tissue over triceps.

Intramuscular (IM) injection – Use a 22–25 gauge needle. Inject in deltoid muscle of arm. Choose the needle length as indicated below:

Gender/Weight	Needle Length
Female or male less than 130 lbs	5/8"*–1"
Female or male 130–152 lbs	1"
Female 153–200 lbs	1–1 1/2"
Male 153–260 lbs	
Female 200+ lbs	1 1/2"
Male 260+ lbs	

* A 5/8" needle may be used for patients weighing less than 130 lbs (<60 kg) for IM injection in the deltoid muscle only if the subcutaneous tissue is not bunched and the injection is made at a 90-degree angle.

NOTE: Always refer to the package insert included with each biologic for complete vaccine administration information. CDC's Advisory Committee on Immunization Practices (ACIP) recommendations for the particular vaccine should be reviewed as well. Access the ACIP recommendations at www.immunize.org/acip.

Immunization action coalition
IAC
immunize.org

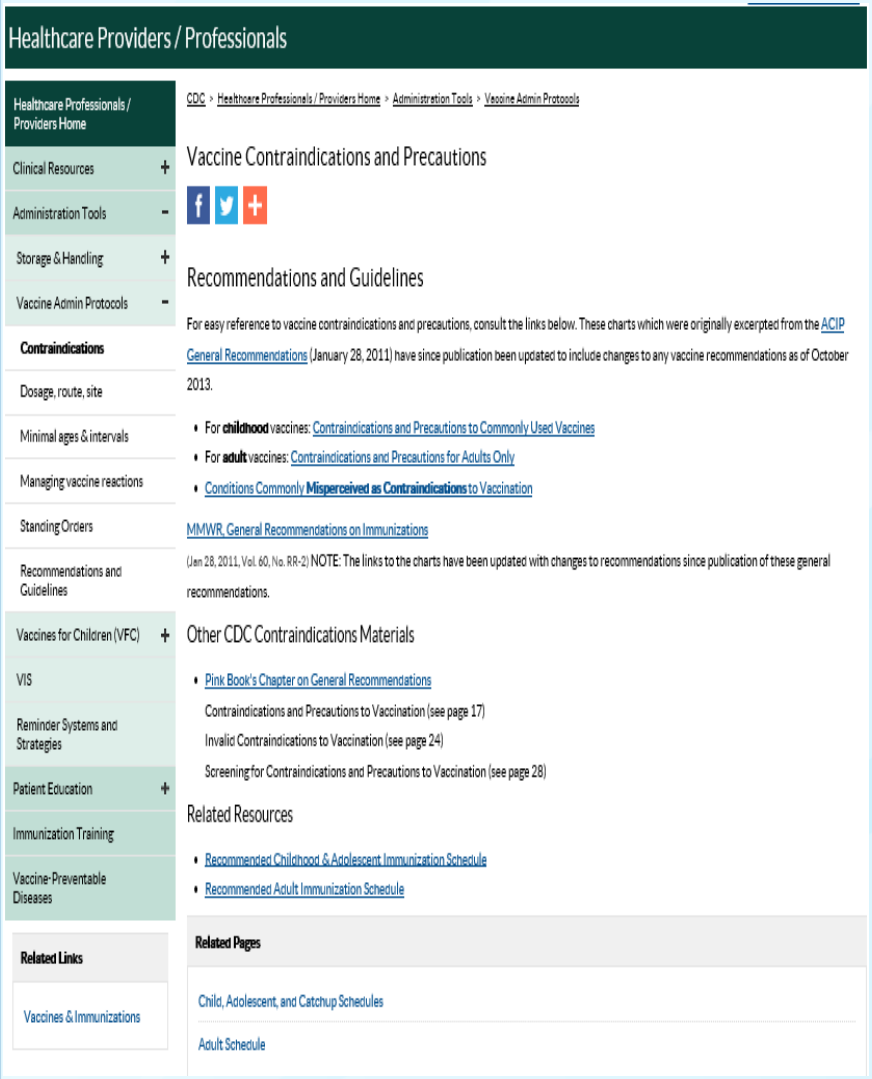
Technical content reviewed by the Centers for Disease Control and Prevention

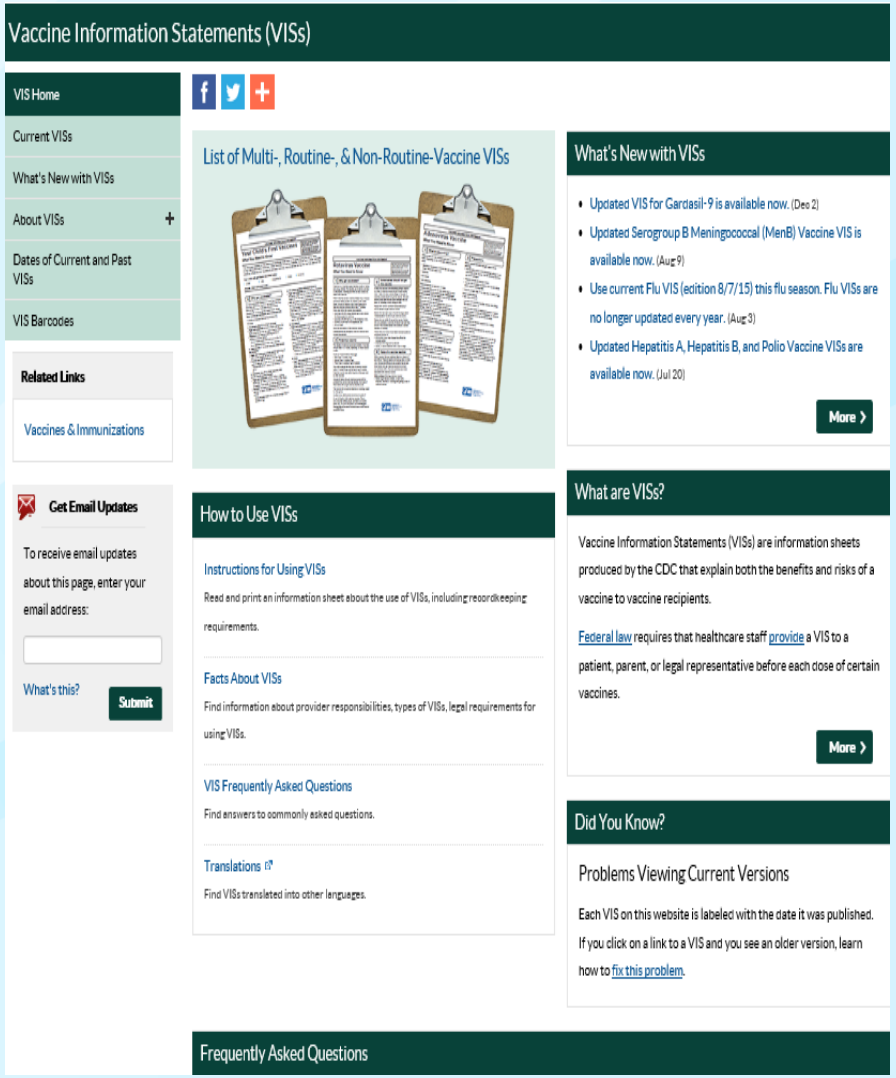
Saint Paul, Minnesota • 651-647-9009 • www.immunize.org • www.vaccineinformation.org

www.immunize.org/catg.d/p3084.pdf • Item #P3084 (9/15)

http://www.immunize.org/catg.d/p3084.pdf

Screening for Contraindications and Precautions

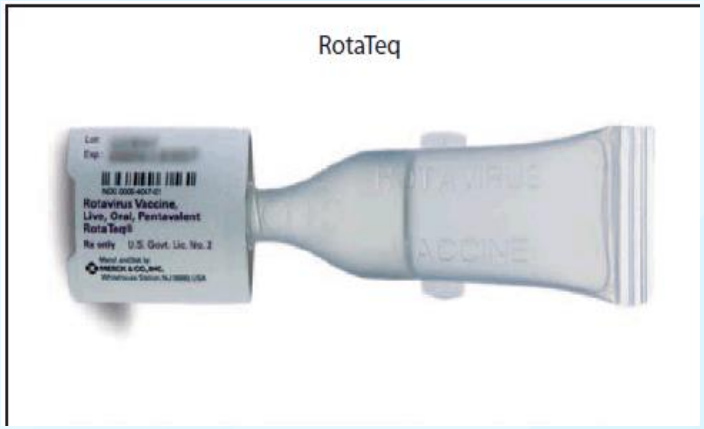




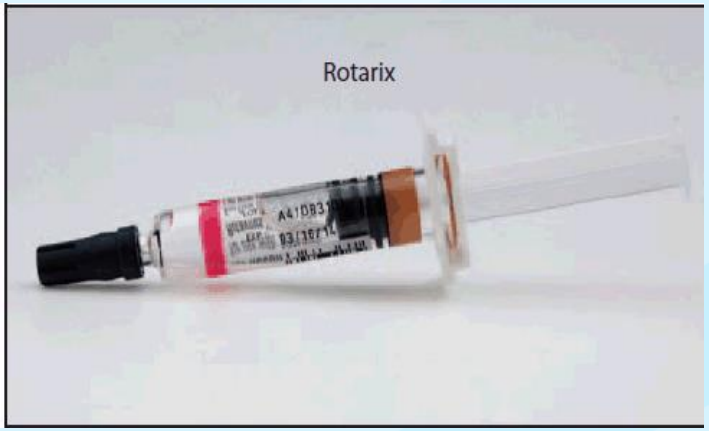
https://www.cdc.gov/vaccines/hcp/admin/contraindications.html
http://www.immunize.org/handouts/screening-vaccines.asp

https://www.cdc.gov/vaccines/hcp/vis/index.html

Rotavirus Vaccine Schedules



RV5 (RotaTeq) Oral Administration
Administer at ages 2, 4, and 6 months



RV1 (Rotarix) Oral Administration
Administer at ages 2 and 4 months

- For infants who have not received RV vaccine by age 2 months, give the first dose at the earliest opportunity but no later than age 14 weeks 6 days*
- Schedule subsequent doses by observing minimum intervals of 4 weeks between the remaining dose(s)
- If first dose is inadvertently administered at age 15 weeks or older, administer remaining doses*
- Do not administer any RV vaccine beyond the age of 8 months 0 days*

*ACIP off-label; https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/rotavirus.html

Hepatitis A Vaccination of Children

- All children should receive 2 doses of HepA vaccine between 12 and 23 months of age
- The minimum interval between doses is 6 calendar months
- Children who are not vaccinated by 2 years of age can be vaccinated at subsequent visits

https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepa.html

http://eziz.org/assets/docs/IMM-508.pdf

Tdap

- **Administer one dose of Tdap to children and teens 7 years of age and older who:**
  - Lack documentation of at least 4 doses of diphtheria, tetanus, and pertussis vaccine, with at least one of the doses given after age 4 years and with the most recent dose given a minimum of 4 calendar months after the preceding dose*
  - Lack documentation of at least 3 doses of diphtheria and tetanus vaccine (i.e., DT, Td),
  - Lack of history of pertussis-containing vaccine given at age 10 years or older
    - For children 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose at age 11 through 12 years may be administered*
  - Are currently pregnant and no documentation of Tdap given during the current pregnancy*

*ACIP off-label:
https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/tdap-td.html ;

HPV

Recommended number of doses	Recommended dosing schedule	Population
2	0, 6–12 months*	Persons initiating vaccination at ages 9 through 14 years, except immunocompromised persons
3	0, 1–2, 6 months**	Persons initiating vaccination at ages 15 through 26 years, and immunocompromised persons initiating vaccination at ages 9 through 26 years

Footnotes

* In a 2-dose schedule of HPV vaccine, the minimum interval is 5 months between the first and second dose

** In a 3-dose schedule of HPV vaccine, the minimum intervals are 4 weeks between the first and second dose, 12 weeks between the second and third dose, and 5 months between the first and third dose

HPV vaccine may be given at the same time as other vaccines.

https://www.cdc.gov/vaccines/vpd/hpv/hcp/administration.html

HPV "Ask the Experts"

Scheduling and Administering Vaccines

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What is the recommended schedule for administering HPV vaccine?

ACIP recommends a routine 2-dose HPV vaccine schedule for adolescents who start the vaccination series before the 15th birthday. The two doses should be separated by 6 to 12 months. The minimum interval between doses is 5 calendar months.

A 3-dose schedule is recommended for people who start the series on or after the 15th birthday and for people with certain immunocompromising conditions (such as cancer, HIV infection, or taking immunosuppressive drugs). The second dose should be given 1 to 2 months after the first dose and the third dose 6 months after the first dose. The minimum interval between the first and second doses of vaccine is 4 weeks. The minimum interval between the second and third doses of vaccine is 12 weeks. The minimum interval between the first and third doses is 5 calendar months. If the vaccination series is interrupted, the series does not need to be restarted.

Has ACIP expressed a preference for the 2-dose over the 3-dose schedule for adolescents 9 through 14 years of age?

Yes. ACIP recommends the 2-dose schedule for people starting the HPV vaccination series before the 15th birthday, as long as they are immunocompetent.

If a dose of HPV vaccine is significantly delayed, do I need to start the series over?

No, do not restart the series. You should continue where the patient left off and complete the series.

Can the 4-day "grace period" be applied to the minimum intervals for HPV vaccine?

Yes.

A 16 year old received the third dose of HPV vaccine 12 weeks after the second dose but only 4 months after the first dose. Should the third dose be repeated?

Yes. If an HPV vaccine dose is administered at less than the recommended minimum interval then the dose should be repeated. The repeat dose should be given a minimum interval after the most recent dose. In this example the repeat dose should be administered at least 5 months after the invalid third dose.

Does the 2-dose HPV vaccine schedule need to be completed with the same vaccine, or can it include different vaccines (such as bivalent or quadrivalent vaccine)?

The 2-dose schedule can be completed with any combination of HPV vaccine brands as long as dose #1 was given before age 15 years. Dose #2 should be administered 6–12 months after dose #1.

If dose #1 of HPV vaccine was given before the 15th birthday and it has been more than a year since that dose was given, would the series be complete with just one additional dose?

Yes. Adolescents and adults who started the HPV vaccine series prior to the 15th birthday and who are not immunocompromised are considered to be adequately vaccinated with just one additional dose of HPV vaccine.

We have adolescents in our practice who have received the first 2 doses of the HPV series 1 or 2 months apart according to the 3-dose schedule. Can we consider their HPV vaccine series to be complete or do we need to give these patients a third dose?

People who have received 2 doses of HPV vaccine separated by less than 5 months should receive a third dose 6–12 months after dose #1 and at least 12 weeks after dose #2.

Will the 2-dose recommendation be retroactive for children and teens vaccinated prior to 2016?

Yes. Any person who ever received 2 doses of any combination of HPV vaccines can be considered fully vaccinated if dose #1 was given before the 15th birthday and the 2 doses were separated by at least 5 months.

I work with university students and many of them miss coming in on time for their next dose of HPV vaccine. What's the longest interval allowed before we need to start the series over?

No vaccine series needs to be restarted because of an interval that is longer than recommended (with the exception of oral typhoid vaccine in certain circumstances). You should continue the series where it was interrupted. If the HPV series is begun when the university student is age 26 or younger, it can be completed after the student turns 27.

Is it recommended that patients age 26 years start the HPV vaccination series even though they will be older than 26 when they complete it?

Yes. HPV vaccine is recommended for all women through age 26 years and also may be given to men through that age. So, the 3-dose series can be started at age 26 even if it will not be completed at age 26. The series should be completed regardless of the age of the patient (i.e., even if the patient is older than 26). In certain situations, some clinicians choose to start the 3-dose HPV series in patients who are older than 26 years. This, however, is an off-label use.

We inadvertently gave HPV vaccine to a woman who didn't know she was pregnant at the time. How should we complete the schedule?

Merck has a registry for women who inadvertently receive HPV vaccine during pregnancy (telephone 800-986-8999). You should withhold further HPV vaccine until she is no longer pregnant. After the pregnancy is completed, administer the remaining doses of the series using the usual 2- or 3-dose schedule (depending on the age at initiation of the series).

I have read that HPV vaccine should not be administered to pregnant women. Do we need to perform a pregnancy test prior to administering this vaccine to our patients? Currently, we ask about pregnancy prior to providing the vaccine.

HPV vaccine is not recommended for use in pregnant women. HPV vaccines have not been associated causally with adverse outcomes of pregnancy or adverse events in the developing fetus. However, if a woman is found to be pregnant after initiating the vaccination series, the remainder of the series should be delayed until completion of pregnancy. Pregnancy testing is not needed before vaccination. If a vaccine dose has been administered during pregnancy, no intervention is needed.

Can HPV vaccine be administered at the same time as other vaccines?

Yes, administration of a different inactivated or live vaccine, either at the same visit or at any time before or after HPV vaccine, is acceptable because HPV is not a live vaccine.

If HPV vaccine is given subcutaneously instead of intramuscularly, does the dose need to be repeated?

Yes. No data exist on the efficacy or safety of HPV vaccine given by the subcutaneous route. All data on efficacy and duration of protection are based on a vaccine series administered by the intramuscular route. In the absence of data on subcutaneous administration, CDC and the manufacturer recommend that a dose of HPV vaccine given by any route other than intramuscular should be repeated. There is no minimum interval between the invalid (subcutaneous) dose and the repeat dose.

If a 30-year-old female patient insists that she wants to receive HPV vaccine, can I give it to her?

HPV vaccine is not approved for use in women older than age 26 years. Studies have shown that the vaccine is safe in women age 27 years and older. ACIP does not recommend the use of this vaccine outside the FDA licensing guidelines unless the series was started but not completed by age 26 years. Clinicians may choose to administer HPV vaccine off-label to men and women age 27 years or older and should decide if the benefit of the vaccine outweighs the hypothetical risk.

http://www.immunize.org/askexperts/experts_hpv.asp#schedules

Influenza Vaccine Products for the 2016–2017 Influenza Season

Manufacturer	Trade Name (vaccine abbreviation)[1]	How Supplied	Mercury Content (µg Hg/0.5mL)	Age Group	Vaccine Product Billing Code[2]	
					CPT	Medicare[3]
AstraZeneca	FluMist[4] (LAIV4)	0.2 mL (single-use nasal spray)	0	2 through 49 years	90672	90672
GlaxoSmithKline	Fluarix (IIV4)	0.5 mL (single-dose syringe)	0	3 years & older	90686	90686
ID Biomedical Corp. of Quebec, a subsidiary of GlaxoSmithKline	FluLaval (IIV4)	0.5 mL (single-dose syringe)	0	6 months & older	90686	90686
		5.0 mL (multi-dose vial)	<25	6 months & older	90688	90688
Protein Sciences Corp.	Flublok (RIV3)	0.5 mL (single-dose vial)	0	18 years & older	90673	90673
Sanofi Pasteur, Inc.	Fluzone (IIV4)	0.25 mL (single-dose syringe)	0	6 through 35 months	90685	90685
		0.5 mL (single-dose syringe)	0	3 years & older	90686	90686
		0.5 mL (single-dose vial)	0	3 years & older	90686	90686
		5.0 mL (multi-dose vial)	25	6 through 35 months	90687	90687
		5.0 mL (multi-dose vial)	25	3 years & older	90688	90688
	Fluzone High-Dose (IIV3-HD)	0.5 mL (single-dose syringe)	0	65 years & older	90662	90662
	Fluzone Intradermal (IIV4-ID)	0.1 mL (single-dose microinjection system)	0	18 through 64 years	90630	90630
Seqirus (formerly Novartis influenza vaccines and bioCSL)	Afluria (IIV3)	0.5 mL (single-dose syringe)	0	9 years & older[5,6]	90656	90656
		5.0 mL (multi-dose vial)	24.5		90658	Q2035
	Afluria (IIV4)	0.5 mL (single-dose syringe)	0	18 years & older[6]	90686	90686
		5.0 mL (multi-dose vial)	24.5		90688	90688
	Fluad (aIIV3)	0.5 mL (single-dose syringe)	0	65 years & older	90653	90653
	Fluvirin (IIV3)	0.5 mL (single-dose syringe)	≤1	4 years & older	90656	90656
		5.0 mL (multi-dose vial)	25		90658	Q2037
	Flucelvax (ccIIV4)	0.5 mL (single-dose syringe)	0	4 years & older	90674	90674

Footnotes

1. IIV3 = egg-based and cell culture-based trivalent inactivated influenza vaccine (injectable); where necessary to refer to cell culture-based vaccine, the prefix "cc" is used (e.g., ccIIV3). IIV4 = egg-based quadrivalent inactivated influenza vaccine (injectable); RIV3 = trivalent recombinant hemagglutinin influenza vaccine (injectable); aIIV3 = adjuvanted trivalent inactivated influenza vaccine.
2. Effective for claims with dates of service on or after 1/1/2011, CPT (Current Procedural Terminology) code 90658 is no longer payable for Medicare; rather, HCPCS (Healthcare Common Procedure Coding System) Q codes, as indicated above, should be submitted for payment purposes.
3. An administration code should always be reported in addition to the vaccine product code. Note: Third party payers may have specific policies and guidelines that might require providing additional information on their claim forms.
4. ACIP recommends not using FluMist during the 2016–17 influenza vaccination season.
5. In 2010, ACIP recommended that Afluria not be used in children younger than age 9 years. If no other age-appropriate IIV is available, Afluria may be considered for a child age 5 through 8 years at high risk for influenza complications, after risks and benefits have been discussed with the parent or guardian. Afluria should not be used in children younger than age 5 years. This recommendation continues for the 2016–2017 influenza season.
6. Afluria is approved by the Food and Drug Administration for intramuscular administration with the Pharmajet Stratis Needle-Free Injection System for persons age 18 through 64 years.

Immunization Action Coalition Saint Paul, Minnesota • 651-647-9009 • www.immunize.org • www.vaccineinformation.org

Technical content reviewed by the Centers for Disease Control and Prevention
www.immunize.org/catg.d/p4072.pdf • Item #4072 (11/16)

http://www.immunize.org/catg.d/p4072.pdf

Combination Vaccines General Recommendations

- The minimum age for administration of combination vaccines is the oldest minimum age for any of the individual components
- The minimum interval between doses is equal to the greatest minimum interval of any of the individual components
- Combination vaccines can be used whenever any components of the combination are indicated and its other components are not contraindicated and if licensed by the FDA for that dose in the series

MMWR 2011, 60(2):6-8

Quick Reference to Combination and/or Reconstituted Vaccines: Childhood

(Highlight Vaccines in Your Refrigerator and Post)

Brand Name	What it contains	Use for Ages:	Use for Dose:	Administration Tips[1]
Pentacel® SP	DTaP, IPV + Hib	6 weeks through 4 years	1, 2, 3 or 4 of DTaP, IPV or Hib	• Draw up the DTaP/IPV liquid (diluent) • Add diluent to the Hib vial; shake well • Administer within 30 minutes; give IM
Pediarix® GSK	DTaP, IPV, Hep B	6 weeks through 6 years	1, 2, or 3 of IPV or DTaP; any dose of hep B	• Premixed • Shake well before administering; give IM
Kinrix® GSK	DTaP, IPV	4 through 6 years	5th dose of DTaP; 4th (valid) dose of IPV[2]	• Premixed • Shake well before administering; give IM
Quadracel™ SP	DTaP, IPV	4 through 6 years	5th dose of DTaP 4th or 5th dose of IPV	• Premixed • Shake well before administering; give IM
ProQuad® Merck	MMR, Var (MMRV)	If 1st dose: ages 12-47 mo, use separate MMR & Var If 1st dose: ages 4-12 years, use MMRV If 2nd dose: ages 15 mo-12 years, use MMRV		• Draw up "diluent for Merck vaccines" • Add diluent to MMRV vial; shake well • Administer within 30 minutes; give SC
MMR II® Merck	MMR	12 months and older	1 or 2 of MMR	• Draw up "diluent for Merck vaccines" • Add diluent to MMR vial; shake well; give SC
ActHIB® SP	Hib	6 weeks through 4 years	Any dose of Hib	• Draw up diluent packaged with Hib vial • Add diluent to Hib vial; shake well; give IM
Hiberix® GSK	Hib	6 weeks through 4 years	Any dose of Hib	• Draw up diluent packaged with Hib vial • Add diluent to Hib vial; shake well; give IM
Varivax® Merck	Var	12 months and older	1 or 2 of Var	• Draw up "diluent for Merck vaccines" • Add diluent to Varicella vial; shake well • Administer within 30 minutes; give SC
Menveo® Novartis	MCV4	2 months through 55 years	Any dose of MCV4	• Draw up MenCYW liquid (diluent) • Add to MenA vial; invert; shake well; give IM
Rotarix®, GSK	RV1 (Rotavirus)	6 weeks through 7 months	Any dose of RV	• Use diluent in pre-filled oral applicator • Add to RV1 vial; shake; withdraw; give orally

[1]Refer to the manufacturer's package insert for further details regarding reconstituting and/or administering these products

[2]When used in combination with Pentacel (DTaP-IPV-Hib), Kinrix may be used for the 5th (4th valid) dose of the Hib series

Avoid medication errors! Use only the diluent that is packaged or sent with each specific vaccine—don't use any other liquid

February 8, 2016

http://www.michigan.gov/documents/mdch/4QuickLookComboReconVax112508_258829_7.pdf

HepB Birth Dose Followed by Pediarix

- Use HepB single-antigen for birth dose
- Pediarix administered at 2, 4, and 6 months
- Dose 4 must be given at 24 weeks or later and at least 16 weeks from dose 1. There is no minimum interval between dose 4 and the previous dose”

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5210a8.htm
https://www.cdc.gov/vaccines/programs/cocasa/reports/algorithm-ref.html

Reducing Injection Pain General Recommendations

- **Use age-appropriate strategies alone or in combination to reduce pain during injections**
  - Rapid injection without aspiration
  - Administer the most painful vaccine last
  - Distraction (e.g., singing, books, blowing bubbles)
  - Deep breathing techniques
  - Rub/stroke the skin near the injection site
  - Topical analgesia
  - Sitting upright
  - Infants: Ingesting sweet-tasting liquids or breastfeeding

https://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf

Reducing Injection Pain

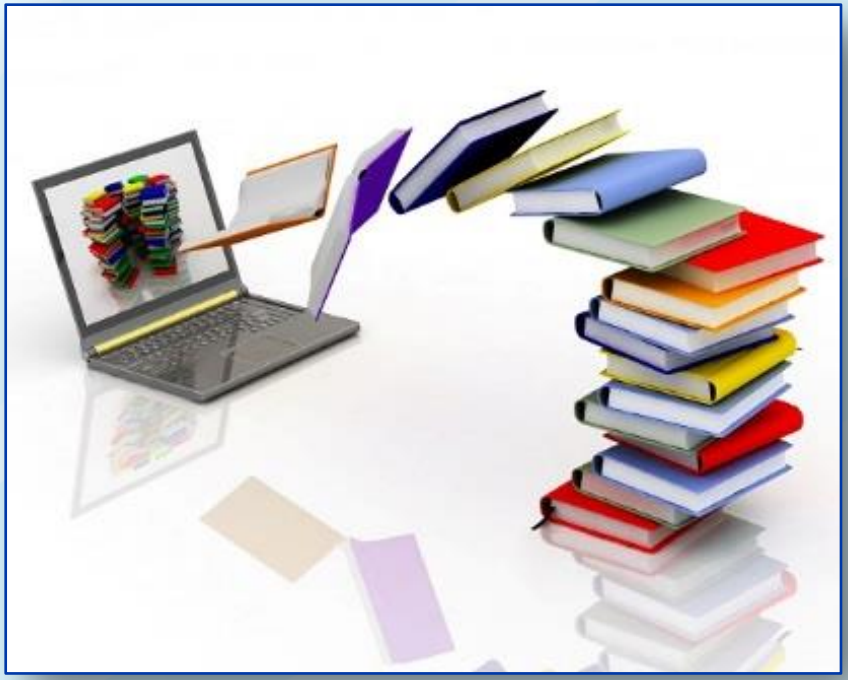
- **Recent study found physical intervention called the 5 S's provided significant pain reduction with or without sucrose after 2 and 4 month vaccinations**
  - Swaddling
  - Side/stomach position
  - Shushing
  - Swinging
  - Sucking

http://www.youtube.com/watch?v=WkR_e1L6zxI

John W. Harrington, MD, Stacey Logan, MD, Courtney Harwell, MD, Jessica Gardner, MD, Jessica Swingle, BS, Erin McGuire, MSa, and Rosemarie Santos, MD *Pediatrics* April 16th, 2012. doi: 10.1542/peds.2011-1607

Administer Vaccines SAFELY!

- Syncope (vasovagal or vasodepressor reaction) can occur after vaccination and is most common among adolescents and young adults
- Of particular concern among adolescents has been the risk for serious secondary injuries, including skull fracture and cerebral hemorrhage
- Providers should take appropriate measures to prevent injuries if a patient becomes weak or dizzy or loses consciousness
- Adolescents and adults should be seated or lying down during vaccination
- Vaccine providers, particularly when vaccinating adolescents, should consider observing patients (with patients seated or lying down) for 15 minutes after vaccination to decrease the risk for injury should they faint
- If syncope develops, patients should be observed until the symptoms resolve



IMMUNIZATION RESOURCES

Vaccine and Immunization Resources

- **Questions? E-mail CDC**
  - Providers nipinfo@cdc.gov
  - Parents and patients www.cdc.gov/cdcinfo
- **CDC website** www.cdc.gov/vaccines
- **Twitter for health care personnel** @DrNancyM_cdc
- **Influenza** www.cdc.gov/flu
- **Vaccine Safety** www.cdc.gov/vaccinesafety
- **State Immunization Programs**

www.cdc.gov/vaccines/imz-managers/awardee-mz-websites.html

CDC Immunization Apps for Health Care Personnel

- **Vaccine Schedules**
  www.cdc.gov/vaccines/schedules/hcp/schedule- app.html
- **Influenza information**
- **www.cdc.gov/flu/apps/cdc-influenza-hcp.html**
- **Morbidity and Mortality Weekly Report (MMWR)**
  - www.cdc.gov/mobile/applications/mobileframework/mmwrpromo.html
- **Travel Well**
- **www.nc.cdc.gov/travel/page/apps-about**

Storage and Handling and Vaccine Administration Resources

- **Immunization Action Coalition Vaccine Administration web page**

  www.immunize.org/handouts/administering-vaccines.asp

- **Also check Awardee Immunization Program websites**

  www.cdc.gov/vaccines/imz-managers/awardee-imz-websites.html


Thank You!
Questions?